

2023 WASSCE MATHEMATICS (CORE) 2

SECTION A

[40 marks]

Answer all the questions in this section. All questions carry equal marks.

1. In a talent hunt competition of 35 artistes, they indicated their interest in playing Piano, Bagpipes, and Guitar. Out of the number, 24 preferred Piano, 16 Bagpipes and 18 Guitar. 8 preferred Piano only, 2 Bagpipes only and 6 Guitar only. 4 played all the three instruments while 7 preferred Piano and Bagpipes only.

(a) Illustrate the information in a Venn diagram.

(b) Find the number of artistes who preferred:

(i) **only** two types of instruments;

(ii) **only** one type of instrument.

2. Araba walked $2t$ km from a village, S to visit a friend in another village, T on a bearing of 065° . After spending some time with her friend, she continued to a nearby town, U,

$3t$ km away on a bearing of 155° . If the distance between S and U is $6\sqrt{13}$ km:

(a) illustrate the information in a diagram;

(b) calculate, correct to the **nearest** whole number, the:

(i) value of t ;

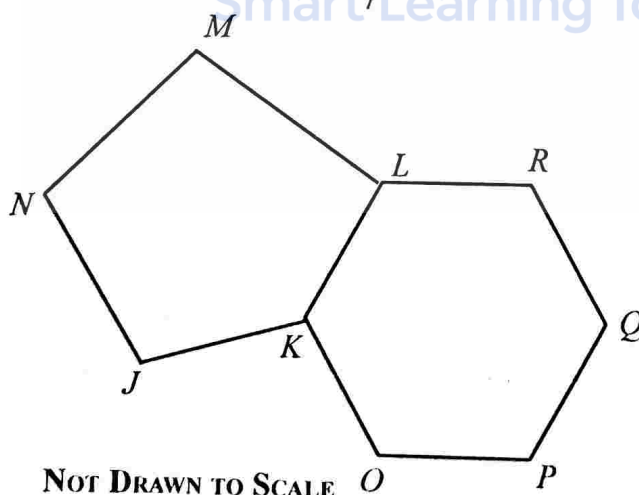
(ii) bearing of U from S.

3. In the frustrum of a cone, the bottom diameter is **thrice** the top diameter.

(a) If the height of the frustrum is 12 cm, calculate the height of the whole cone.

(b) Given that the volume of the whole cone is $39,600 \text{ cm}^3$, find, correct to **four** significant figures, the radius. [Take $\pi = \frac{22}{7}$]

4.



In the diagram, $JKLMN$ is a regular pentagon and $KOPQLR$ is a regular hexagon. Find:

(a) $\angle JNM$;

(b) $\angle KOP$;

(c) $\angle MLR$.

5. The mean age of a second year class of a school is $18\frac{2}{5}$. At the end of the promotion examination, 3 students aged 20, 19 and 19 years were repeated. The new mean age of the class became $18\frac{1}{3}$. Calculate the number of students who were in the class before the promotion examination.

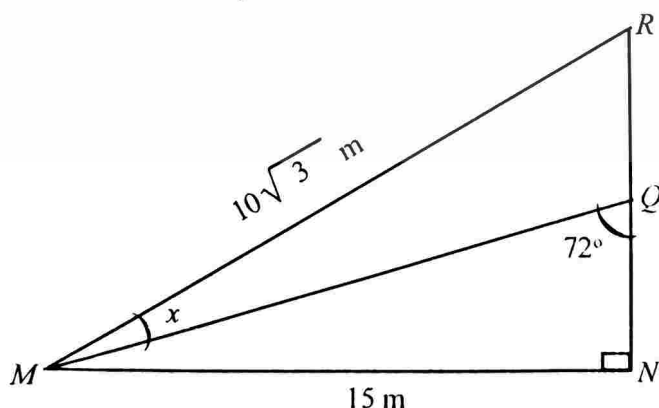
SECTION B

[60 marks]

Answer five questions only from this section. All questions carry equal marks.

6. (a) In a certain spider web, the lengths of the shortest and longest threads are 3.4 mm and 50.2 mm respectively. The successive equally spaced threads are 1.2 mm apart. If the length of the cross threads form an Arithmetic Progression (A.P), find the number of cross threads.
- (b) At noon, a cargo plane leaves Lusaka airport and heads towards Kitwe 500 km away at 180 km/h. At 1.00 pm, a jet takes off from Lusaka and flies on the same course at 450 km/h. What time will the jet overtake the cargo plane?
7. A man left an estate for his wife, extended family and children; Owusu, Nancy and Esther. In the will, $\frac{1}{3}$ of the estate must be given to Owusu, $\frac{1}{3}$ of the remaining to Nancy, $\frac{3}{4}$ of what still remains to Esther, $\frac{2}{3}$ of the remaining to the wife and the rest to the extended family. If the wife received a total of GH¢ 105,500.00 as her share of the estate, find the:
- (a) total value of the estate;
- (b) extended family's share of the estate.

8.

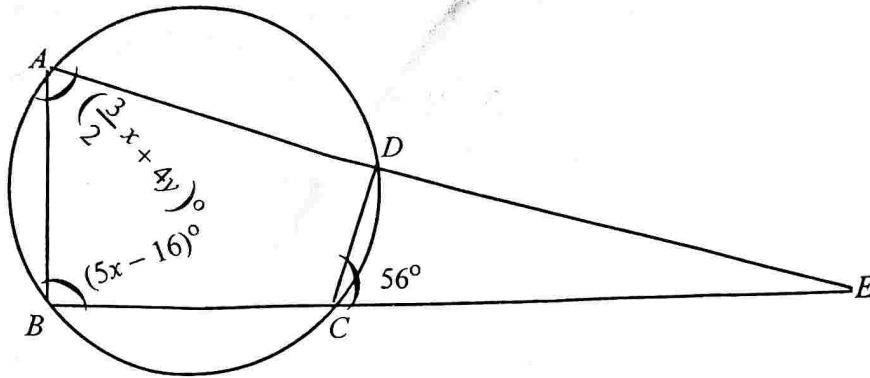


NOT DRAWN TO SCALE

In the diagram, MNR is right angle triangle. $|MN| = 15\text{ m}$, $|MR| = 10\sqrt{3}\text{ m}$ and $\angle MQN = 72^\circ$. Calculate, correct to the nearest whole number:

- (a) the value of the angle marked x ;
- (b) $|QR|$;
- (c) area of $\triangle MQR$.

9.



NOT DRAWN TO SCALE

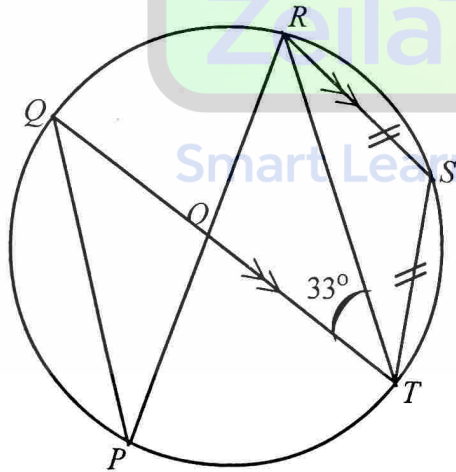
In the diagram, A, B, C, D are points on a circle. ADE and BCE are straight lines.

$\angle DCE = 56^\circ$, $\angle ABE = (5x - 16)^\circ$ and $\angle BAE = \left(\frac{3}{2}x + 4y\right)^\circ$. If $\angle DCE : \angle CDE = 7:8$, find:

- (a) $\angle AEB$;
- (b) the values of x and y .

10. (a) A cupboard contains three kinds of notebooks: D , E and F , all of the same size. The number of book D is 3 more than half of book F . The number of E is one-third the number of F .
- (i) If there are 25 books in the cupboard, find the number of each kind of book.
 - (ii) If a book is picked at random from the cupboard, what is the probability that it is E or F ?

(b)



NOT DRAWN TO SCALE

In the diagram $PQRST$ is a circle with centre O . POR and QOT are straight lines, $\overline{QT} \parallel \overline{RS}$, $\angle RTQ = 33^\circ$ and $|\overline{RS}| = |\overline{ST}|$. Find $\angle RST$.

11. (a) From the top, K of a building 320 m high, the angles of depression of the top, L and bottom, M of another building on the same horizontal ground are 29° and 41° respectively.
- Illustrate the information in a diagram.
 - Calculate, correct to the nearest metre, the height of the other building.
- (b) The time taken to travel a distance of 120 km was reduced by 30 minutes when the speed was increased by 20 km/h. Calculate the initial speed.

12. (a) The following statements are true of a certain community.
- I : Most businessmen are rich.
 C : No salary worker is rich.
- Draw a Venn diagram to illustrate the information.
 - State whether the following statements are **Valid** or **Not Valid**.
 - Joe is a businessman and is therefore rich.
 - Kipo is **not** rich because he is a salary worker.

(b)

Heights (cm)	60 — 64	65 — 69	70 — 74	75 — 79	80 — 84
Frequency	7	6	5	8	4

The table shows the distribution of height of seedlings in a nursery. Calculate, correct to one decimal place, the:

- mean;
- variance of the distribution.

13. (a) Using a scale of 2 cm to 1 unit on both axes, draw on a graph sheet two perpendicular axes ox and oy for $0 \leq x \leq 8$ and $-6 \leq y \leq 6$.

- Plot the points $M(3, 1)$, $N(1, 1)$ and $P(3, 5)$. Join the points to get $\triangle MNP$.
- Draw image triangle $M_1N_1P_1$ which is the reflection of $\triangle MNP$ in the x -axis where $M \rightarrow M_1$, $N \rightarrow N_1$ and $P \rightarrow P_1$. Indicate clearly the coordinates of M_1 , N_1 and P_1 .
- Draw the image triangle $M_2N_2P_2$ which is the image of $\triangle MNP$ under the mapping $\begin{pmatrix} x \\ y \end{pmatrix} \rightarrow \begin{pmatrix} 2x \\ -y \end{pmatrix}$, where $M \rightarrow M_2$, $N \rightarrow N_2$ and $P \rightarrow P_2$.

Indicate clearly the coordinates of M_2 , N_2 and P_2 .

- (b) Find the equation of the line joining the points M and M_2 .

END OF PAPER